REMARKS

By amendment above, independent Claim 20 has been amended to recite that "thickness variation of the features is less than 10% with a standard deviation of 3" and to recite that the microelectronic workpiece has more than one through-mask opening. Independent Claims 29, 44, and 45 have been amended in a similar fashion as Claim 20. Dependent Claims 28 and 37 have been canceled. Accordingly, Claims 20-27, 29-36, 44, and 45 are pending and active in the subject application.

In the outstanding Examiner's Action, independent Claims 20, 29, 44 and 45 were rejected under 35 U.S.C. § 103 as being unpatentable over the *Galvanotechnik* (1991) article by Schmidt, in combination with U.S. Patent No. 6,679,983 to Morrissey et al., and the *J. Micromech. Microeng.* (2000) article by Ruythooren et al.

For the following reasons, applicants assert the subject matter of independent Claims 20, 29, 44, and 45 is not obvious.

The Schmidt reference is a German language article that includes an English abstract. In order to more fully respond to the outstanding rejection based on Schmidt, applicants obtained a professional translation of the Schmidt reference. A copy of that professional translation is included in the concurrently filed supplemental IDS.

As amended, independent Claims 20 and 29 each recite a process for electroplating copper on a microelectronic workpiece in a through-mask plating application at a rate of at least 2 μm/min. As amended, independent Claims 44 and 45 each recite a process for electroplating copper on a microelectronic workpiece in a through-mask plating application at a rate of about 4 μm/min. to about 6 μm/min. The claimed processes provide a plating bath comprising Cu^{2+}, H_2SO_4, Cl^-, a brightener, a wetting agent, and water. Each of these independent claims goes on to further recite that the process for electroplating copper on a microelectronic workpiece in a

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through-mask plating application includes the steps of providing a microelectronic workpiece having more than one through-mask opening with a conductive layer at the bottom of the opening; contacting the conductive layer with the plating bath; providing electroplating power between the conductive layer and an anode disposed in electrical contact with the plating bath; depositing copper onto the conductive layer at the recited rate to form a feature in each of the more than one through-mask openings wherein thickness variation of the features is less than 10% with a standard deviation of 3.

The combination of Schmidt, Morrissey et al., and Ruythooren et al. does not describe or suggest a process for electroplating copper on a microelectronic workpiece in a through-mask plating application at rates of at least 2 μm/min or between about 4 μm/min to about 6 μm/min wherein the thickness variation of the deposited features is less than 10%.

Applicants acknowledge that the abstract for the primary Schmidt reference describes:

> The Cu electroplates show a uniform structural and high quality appearance . . . .

However, Schmidt does not describe that the "uniform structural" properties include thickness variation amongst features.

Secondly, the reference to "uniform structural and high quality appearance" in the abstract of the Schmidt reference is in the context of an electroplating process carried out using a plate-to-plate configuration not plating into through-mask openings. For example, according to page 2, third full paragraph, of the English translation of the Schmidt reference:

> The deposition of the copper layers to be examined therefore took place in a flow cell with a plate-plate geometry, developed and built at . . . .

(Emphasis added.)

Schmidt further describes at page 3, last paragraph:

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> All deposition tests were performed with defined, pretreated titanium cathodes, to ensure that the copper layers could be stripped away nondestructively for the subsequent tests.

Schmidt does not describe a process that forms features in each of more than one through-mask openings wherein thickness variation of the features is less than 10% with a standard deviation of 3.

In addition, neither the secondary Morrissey et al. or Ruythooren et al. references describe achieving a thickness variation as recited in independent Claims 20, 29, 44, and 45. In fact, Ruythooren et al. at page 106, Figure 10, in the first bullet point under heading 4, describes it is difficult to achieve uniform thickness of deposits:

> The uniformity of deposits, i.e., their thickness and, for alloys, their composition, can be difficult to obtain as it is influenced not only by the electrolyte composition but also by the pattern configuration [34] (Figure 10), the electrogeometry [35] and the electrolyte hydrodynamics [11, 36, 37].

Thus, neither Schmidt alone nor Schmidt in combination with Morrissey et al. or Ruythooren et al. teaches or suggests all of the elements of independent Claims 20, 29, 44, and 45, as amended. In view of the applied references' failure to describe each of the elements of independent Claims 20, 29, 44, and 45, applicants assert that the subject matter of independent Claims 20, 29, 44, and 45, as amended herein, is not obvious.

The balance of the pending claims depend from one of independent Claims 20 or 29 and therefore are not obvious over the applied references for the same reasons that the independent claims are not obvious over the applied references.

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In view of the above, applicants respectfully request withdrawal of the outstanding rejections and allowance of the application. If the Examiner has any questions regarding the above, the Examiner is asked to call applicants' attorney at the number listed below so that any outstanding issues can be resolved in a timely and efficient manner.

Respectfully submitted,

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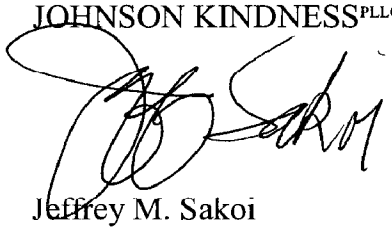

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